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Filed : June 30, 1999

- BM
- b2.
71. The system of Claim ⁶⁰31, wherein the filter strength is based upon the differences of motion vectors of adjacent groups.
- b3.
72. The system of Claim ⁶⁰31, wherein the filter strength relates to the number of pixels from the edge of the macroblocks that are to be filtered.
- 15
73. The method of Claim 1, wherein the pixels in the center of the groups are filtered less strongly than the pixels near the edge of the groups.

REMARKS

In response to the Office Action, Applicant respectfully requests the Examiner to reconsider the above-captioned application in view of the foregoing amendments and the following comments.

The specific changes to the amended claims are shown on a separate set of pages hereto and entitled VERSION WITH MARKINGS TO SHOW CHANGES MADE, which follows the signature page of this Amendment. On this set of pages the insertions are underlined while the deletions are stricken through.

Discussion of Status of the Claims

In the Office Action, the Examiner allowed Claims 32-35 and 38. Claims 32, 38, 40, 41, 43, 44, 47, 48, 50, and 51 were objected to being allowable if rewritten in independent form. Claims 55-73 have been added, and Claims 40, 44, 47, and 50 have been cancelled. By this paper, Claims 1-39, 41-43, 45, 46, 48, 49, and 51-73 are pending.

Discussion of Claim Rejections Under 35 U.S.C. § 103(a)

Applicant has the following comments to the Examiner's rejections under 35 U.S.C. § 103(a).

Claims 9, 17, 24, and 36-38

In the Office Action, the Examiner rejected independent Claims 1, 9, 17, 24, and 36-38 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,568,200, to Pearlstein, et al. (hereinafter "Pearlstein") in view of U.S. Patent No. 6,256,068 to Takada, et al. (hereinafter "Takada"). Claims 32, 38, 40, 41, 43, 44, 47, 48, 50, and 51 were "objected to as being dependent on upon a rejected base claim, but would be allowable if rewritten in independent

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form including all of the limitations of the base claim and any intervening claims because no prior art anticipates or suggests determining a filter strength as disclosed in [these] claims." Applicant respectfully submits that independent Claims 9, 17, 24, 36-38 have been amended to include limitations directed to determining a filter strength and are now in condition for allowance.

Claims 1 and 23

In the Office Action, the Examiner rejected independent Claims 1 and 23 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,568,200, to Pearlstein, et al. (hereinafter "Pearlstein") in view of U.S. Patent No. 6,256,068 to Takada, et al. (hereinafter "Takada").

Independent Claims 1 and 23 are generally directed to a system for generating an intermediate frame from other frames and filtering the at least a portion of the generated third data by reducing visible discontinuity between the perimeters of adjacent *groups* of pixels. After interpolation of a frame based upon one or more base frames, blocks that were adjacent in the base frame may no longer be adjacent in the interpolated frame. Although upon frame interpolation, a block from the base frame may serve as a good substitute for the interpolated block, the pixels at the edges of each interpolated block may not be a perfect match with the pixels at the edge of a neighboring block. Accordingly, in one embodiment, a filter process is employed to the pixels near the edges of the macroblocks. Claim 1 recites: "filtering at least a portion of the generated third data, wherein the strength of the filtering applied is different for pixels near perimeter of the group of pixels than those pixels near the center of group of pixels." Claim 23 recites: "said frame generator reducing visible discontinuities near the perimeters of at least one of the groups of pixels included in said intermediate digital data."

Pearlstein is generally directed to a system for encoding and decoding data in accordance with MPEG standards. Col. 6, lines 47-52 of Pearlstein states: "[f]or example, the first row of macroblocks may be intra-coded in the first frame, and the second row of macroblocks may be intra-coded in the second frame. In this manner, a complete reference frame can be created after a certain number of frames are encoded."

In the Office Action, the Examiner acknowledged that Pearlstein fails to filter a generated frame by reducing visible discontinuity between adjacent elements but took the position that

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these elements are described by Takada. Takada describes a system for reducing flicker on a television screen. To achieve this, Takada describes reducing a gap in brightness between adjacent samples by applying a linear interpolation filter. *See* col. 11, lines 22-25. Applicant respectfully submits that Takada filters each of the pixels on a pixel by pixel basis. Applicant respectfully submits that Takada does not organize the pixels into groups and then filter the pixels on the perimeter of the pixel groups, *e.g.*, a macroblock.

Since neither Pearlstein or Takada teach or suggest “wherein the strength of the filtering applied is different for pixels near perimeter of the group of pixels than those pixels near the center of the group of pixels”, as is recited in Claim 1, or “reducing visible discontinuities near the *perimeters* of at least one of the *groups of pixels* included in said intermediate digital data”, as is recited in Claim 23, Applicant respectfully submits that these claims are in condition for allowance. Applicant notes that although these are some of the differences in the claims, there are other differences that have not yet been discussed.

Claims 2-8, 10-16, 18-22, 25-31, 33-35, 36, 39, 41-43, 45, 46, 49, and 51

Since Claims 2-8, 10-16, 18-22, 25-31, 33-35, 36, 39, 41-43, 45, 46, 49, and 51, each depend on one of Claims 1, 9, 17, 23, 24, and 32, Applicant respectfully submits that these claims are allowable for the reasons previously discussed.

Summary

Applicant has endeavored to address all of the Examiner’s concerns as expressed in the outstanding Office Action. Accordingly, amendments to the claims for patentability purposes, the reasons therefore, and arguments in support of the patentability of the pending claim set are presented above. Any claim amendments which are not specifically discussed in the above remarks are not made for patentability purposes, and the claims would satisfy the statutory requirements for patentability without the entry of such amendments. In addition, such amendments do not narrow the scope of the claims. Rather, these amendments have only been made to increase claim readability, to improve grammar, and to reduce the time and effort required of those in the art to clearly understand the scope of the claim language. In light of the above amendments and remarks, reconsideration and withdrawal of the outstanding rejections is

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specifically requested. If the Examiner has any questions which may be answered by telephone, he is invited to call the undersigned directly.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Please amend Claims 1, 7, 9, 15, 17, 30, and 32 as follows:

1. (Twice Amended) In a computer system having a memory, a method of generating video frames comprising:

receiving in the memory first data representing a first video frame, the first data comprising a plurality of elements relating to a group of pixels;

receiving in the memory second data representing a second video frame, the second data comprising a plurality of elements relating to a group of pixels;

generating third data representing at least one video frame based upon information from the first and/or second data, the third data comprising a plurality of elements ~~having visible discontinuity between adjacent elements~~;

storing the third data in the memory; and

filtering at least a portion of the generated third data ~~by reducing visible discontinuity between adjacent elements in the generated third data~~, wherein the strength of the filtering applied is different for pixels near perimeter of the group of pixels than those pixels near the center of the group of pixels.

7. (Twice Amended) The method of Claim 2, further comprising:

~~determining a filter strength~~, wherein the filter strength identifies the number of pixels from the edge of the macroblocks that are to be filtered; and

selectively filtering pixels in each of the macroblock quadrants based upon the filter strength.

9. (Twice Amended) A system for generating video frames, the system comprising:

means for receiving first video frame data in a memory in a computer system, the first video frame data comprising a plurality of elements, each element corresponding to a group of pixels, the first video frame data representing a first video frame;

means for receiving second video frame data in the memory in the computer system, the second video frame data comprising a plurality of elements, each element corresponding to a group of pixels, the second video frame data representing a second video frame;

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means for generating at least one intermediate video frame based upon information from the first video frame data and/or the second video frame data, the third video frame data comprising a plurality of elements, the at least one intermediate video frame representing at least one selected element at a position intermediate to respective positions whereat the element is represented by the first video frame and the second video frame;

means for determining a filter strength, wherein the filter strength relates to the amount of smoothing performed by a filter; and

filter means for reducing visible discontinuity between at least two adjacent elements in the at least one generated intermediate video frame.

15. (Amended) The system of Claim 10, further comprising:

~~means for determining a filter strength for the filtering act,~~ wherein the filter strength relates to identifies the number of pixels from the edge of the macroblock quadrants; and

means for selectively filtering pixels in the macroblock quadrants based upon the filter strength.

17. (Twice Amended) A video presentation, comprising:

first frame data in a memory ~~in a computer system~~, the first frame data representing a first video frame, the first frame data comprising a plurality of elements, each element corresponding to a group of pixels;

second frame data in the memory ~~in the computer system~~, the second frame data representing a second video frame, the second frame data comprising a plurality of elements, each element corresponding to a group of pixels; and

intermediate frame data representing an intermediate video frame between the first and second video frames, the intermediate frame data based upon information from the first and second frame data, the second frame data comprising a plurality of elements, the intermediate video frame representing at least one selected element at a position intermediate to respective positions whereat the selected element is represented by the first video frame and the second video frame, and wherein at least a portion of the intermediate video frame has been filtered in accordance with a determined filter strength so as to reduce visible discontinuities between elements.

24. (Twice Amended) A program storage device, storing instructions which, when executed, perform the method comprising:

receiving first data representing a first video frame, the first data comprising a plurality of elements in a memory in the computer system, each element relating to a group of pixels, the first data representing a first element at a first position in the first video frame;

receiving second data representing a second video frame, the second data comprising a plurality of elements in the memory in the computer system, each element relating to a group of pixels, the second data representing the first element at a second position in the second video frame;

generating third data representing an intermediate video frame based upon information from the first and/or second data, the third data representing the first element at a position intermediate to the first and second positions;

determining a filter strength, wherein the filter strength identifies the amount of smoothing performed by a filter; and

filtering with the filter at least a portion of the intermediate video frame by reducing visible discontinuity between the first element and an adjoining element.

30. (Twice Amended) The program storage device of Claim 25, additionally comprising instructions that when executed perform:

~~determining a filter strength,~~ wherein the filter strength identifies the number of pixels from the edge of the macroblock quadrants; and

selectively filtering pixels in the macroblock quadrants based upon the filter strength.

36. (Twice Amended) A system for generating video frames, the system comprising:

a frame analysis module configure to receive for receiving frames; and

a frame synthesis module configure to generate for generating at least one frame between two received frames, the frame synthesis module determining a filter strength, wherein the filter strength identifies the amount of smoothing performed by a filter; the frame synthesis module filtering with the filter the generated frames thereby reducing visible discontinuities in at least region in the generated frame including adjoining elements that includes visible discontinuities.

37. (Amended) A system for generating video frames, the system comprising:

a frame analysis module configured to receive for receiving frames; and

a frame synthesis module for configured to generate ~~generating~~ at least one frame between two received frames, the frame synthesis module determining a filter strength, and the frame synthesis module filtering the generated frames based upon the determined filter strength.

41. (Amended) The method of Claim 1, ~~additionally comprising determining a filter strength,~~ wherein the filter strength identifies a particular filter from a plurality of filter choices each having different filter characteristics.

43. (Amended) The system of Claim 9, ~~wherein the computer system determines a filter strength,~~ wherein the filter strength identifies a particular filter from a plurality of filter choices each having different filter characteristics.

48. (Amended) The system of Claim 23, ~~wherein the system determines a filter strength,~~ wherein the filter strength identifies a particular filter from a plurality of filter choices each having different filter characteristics.

51. (Amended) The method of Claim 24, ~~additionally comprising determining a filter strength,~~ wherein the filter strength identifies a particular filter from a plurality of filter choices each having different filter characteristics.